Eagle Fatality Compliance Monitoring for the Alta X Wind Energy Project Kern County, California

Report for the First Year of Monitoring Under the Alta Wind X, LLC Incidental Take Permit for Golden Eagles

May 2017 – May 2018

Prepared for

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Cover photo by WEST Biologist, Jamie Chambers

EXECUTIVE SUMMARY

Alta Wind X, LLC (Alta Wind X) owns and operates the Alta X Wind Energy Project ("Alta X" or "Project"; also commonly referred to as Alta East in other documents) in Kern County, California. An eagle conservation plan (ECP) was prepared by Alta Wind X and submitted as part of an application for an eagle take permit (Permit) pursuant to the Bald and Golden Eagle Protection Act (BGEPA) in March 2013. An Environmental Assessment was then prepared by the US Fish and Wildlife Service (USFWS) pursuant to the National Environmental Policy Act to evaluate the effects of issuing a Permit under BGEPA to Alta Wind X. In September 2016, the USFWS published a Finding of No Significant Impact related to the issuance of the Permit. The USFWS then issued the Permit to Alta Wind X in December 2016, allowing for the take of up to three golden eagles over the 5-year Permit duration.

A key component of the Permit and associated ECP was an Eagle Fatality Monitoring Plan (Monitoring Plan) designed to document compliance with the terms of the Permit. The following report describes the methods and results of the first year of compliance monitoring conducted from May 2017 through May 2018 under the Permit. The two primary field components of the compliance monitoring were eagle fatality monitoring and eagle nesting surveys. Reporting on turbine curtailment in response to eagle presence was also required under the Permit and is summarized for the monitoring period.

A study plan for the first year of eagle fatality monitoring was developed in coordination with the USFWS in early 2017, with monitoring initiated in early May 2017. The primary objective of the eagle fatality monitoring was to formally monitor the ground under Project turbines to observe, report, and document any eagle fatalities that may have occurred at the Project during the monitoring period. The Monitoring Plan was designed to detect large-bodied carcasses (e.g., eagles, condors) specifically and included raptor-specific carcass persistence and searcher efficiency trials. The study design was not conducive to estimating fatality rates for birds and bats in general; while all bird and bat fatalities found were included in this report, the analyses are specific to eagles.

Search areas were developed in a Geographic Information System (GIS) by overlaying 240-meter (m) by 240-m square search plots on all 48 turbines, with the turbines located at the center of each plot. All overlap among plots was then dissolved in the GIS, resulting in five large continuous search areas associated with each of five long strings of turbines, and three individual plots where turbines were more dispersed. Given this design, search areas covered all areas within the Project out to a minimum of 120 m from all turbines.

Search areas were surveyed by walking parallel transects spaced approximately 20 m apart, scanning the area out to 10 m on either side of the transect for evidence of fatalities (e.g., carcasses or feather spots). All survey areas were searched approximately every 28 days for 12 consecutive months, from early May 2017 through early May 2018. Bias trials to collect data on searcher efficiency and carcass persistence were conducted using an integrated carcass persistence and detection methodology that utilized the same trial carcasses to document

efficiency and persistence during each trial. All bias trials were conducted using raptor carcasses obtained by Alta Wind X from various southern California resources (e.g., airports, raptor rehabilitators). Species used in trials included red-tailed hawk, Cooper's hawk, red-shouldered hawk, osprey, great horned owl, and barn owl.

Thirteen rounds of surveys were completed at all turbines during the monitoring period and no eagle fatalities, or evidence of eagle fatalities, were documented. However, 30 bird fatalities (17 large birds and 13 small birds) and one bat fatality were documented during the monitoring period. No state or federally listed species were identified among the fatalities documented. Ten raptor carcasses were placed in two integrated bias trials during the monitoring period to estimate searcher efficiency and carcass persistence. Eight of the 10 trial carcasses (80%) were found on the first search following placement, with the two others found on the second or third search following placement. Carcass persistence was estimated based only on the first five carcasses placed, as the second trial was initiated near the end of the monitoring period and was ongoing at the time of this report. Of the five trial carcasses, two were documented as disappearing between checks conducted on days 21 and 29, one disappeared between checks on days 84 and 91, and two persisted for the duration of the trial and were still available on day 91 when the trial concluded. Survival regression modeling, assuming an exponential distribution of the data, resulted in an estimated mean carcass persistence time of approximately 131 days (90% CI 37-290 days).

Based on the bias trial data, we assumed a searcher efficiency rate of 80% and a k = 1.0 (k being the factor by which searcher efficiency changes with each successive search). This indicates that there was no reduction in searcher efficiency if a carcass was missed and found on a subsequent search. Based on the searcher efficiency and carcass persistence data, the resulting site-wide probability a carcass was available and found by searchers (*g*) was 0.752 (95% CI = 0.49 - 0.94) for the year of monitoring. Consistent with the finding of no eagle fatalities during the first year of monitoring, analysis within an Evidence of Absence framework resulted in at least an 80% probability that zero fatalities actually occurred during the monitoring period.

During the May 2017 - May 2018 monitoring period, 90 curtailment calls were made to the Operations Control Center in response to golden eagle presence in the vicinity of turbines. Turbine curtailments lasted from zero (i.e., turbines did not shut down before the curtailment was cancelled) to a maximum of 68 minutes, with 78% of curtailments lasting for 15 minutes or less.

Eagle nesting surveys were conducted within the Project in February and May 2017. Surveys were conducted by vehicle along transmission lines and other areas of infrastructure that could support eagle nests, while two 4-hour-long observational surveys were conducted in one area of rocky outcrops that has some history of use by eagles as a perch location. No raptor or other large stick nests were identified during surveys within the Project.

Having documented no eagle fatalities during the year-long monitoring period, results of the first year of formal eagle fatality monitoring at the Project indicate that Alta Wind X has successfully

completed its first year of operation in compliance with the Project's Permit. A second year of eagle-specific fatality monitoring has already begun at the Project, with a study design that is consistent with the first year of monitoring, except that the search interval has been extended to approximately 60 days, which was based on first year study results and consultation with USFWS. Alta Wind X will continue to implement the mitigation measures identified in their ECP and Permit during the second year of eagle fatality monitoring. An analysis of the 2-year dataset will be completed upon conclusion of the second year of monitoring to ensure that Alta X continues to operate in compliance with its Permit.

1 INTRODUCTION

Alta Wind X, LLC (Alta Wind X) owns and operates the Alta X Wind Energy Project ("Alta X" or "Project"; also commonly referred to as Alta East in other documents) in Kern County, California. An eagle conservation plan (ECP) was prepared by Alta Wind X and submitted as part of an application for an eagle take permit (Permit) pursuant to the Bald and Golden Eagle Protection Act (BGEPA; 1940) in March 2013. An Environmental Assessment was then prepared by the US Fish and Wildlife Service (USFWS) pursuant to the National Environmental Policy Act to evaluate the effects of issuing a Permit under BGEPA to Alta Wind X. In September 2016, the USFWS published a Finding of No Significant Impact (FONSI; USFWS 2016) related to the issuance of the Permit. The USFWS then issued the Permit to Alta Wind X in December 2016, permitting the incidental take of up to three golden eagles (*Aquila chrysaetos*) over the 5-year Permit duration.

A key component of the Permit and associated ECP was an Eagle Fatality Monitoring Plan (Monitoring Plan) designed to document compliance with the terms of the Permit. A final study plan for the first year of eagle fatality monitoring was developed in coordination with the USFWS in early 2017, with monitoring initiated in early May 2017. The Monitoring Plan outlined the components of an eagle fatality monitoring program to be implemented for at least one year (12 months) at Alta X, as described in the Permit (USFWS 2016) and ECP (Alta Wind X 2016*).* The main objective of the Monitoring Plan was to formally monitor the area under Project turbines to observe, report, and document any eagle fatalities that may have occurred at the Project during the study period. In addition to eagle fatality monitoring, eagle nesting surveys were also required under the Permit and ECP, as was reporting on turbine curtailment in response to eagle presence.

Alta Wind X contracted with Western EcoSystems Technology, Inc. (WEST) to assist with implementation of the Monitoring Plan, analysis, and production of a final report. WEST's primary responsibilities were data management, analysis, and reporting, along with oversight of bias trials and providing field assistance for completing fatality searches on an as-needed basis. Alta Wind X personnel conducted the majority of all fatality searches and provided the resulting data to WEST for quality assurance and quality control and analysis. The following report provides the methods and results of the first year of eagle fatality monitoring and eagle nest monitoring at Alta X, along with a brief discussion of the study results as they may pertain to future monitoring efforts. A summary of turbine curtailment activities related to eagle presence is also provided.

2 STUDY AREA

The Project is located in southeastern Kern County, approximately 4.8 kilometers (km; 3.0 miles) northwest of the unincorporated city of Mojave, and 18 km (11 miles) east of the city of Tehachapi (Figure 1). Alta X comprises 48 GE 2.85-megawatt (MW) wind turbine generators (WTGs) located on a combination of privately-owned land and land administered by the Bureau

of Land Management. The WTGs have a hub height of approximately 100 meters (m; 328 feet [ft]) and a rotor diameter of approximately 103 m (338 ft).

The Project is located within the high desert plains and hills on the western edge of the Mojave Desert. The Tehachapi Mountains are located to the north and west of the Project and transition into Mojave Desert to the south and east. Elevations within the Project range from approximately 940 to 1,280 m (3,100 to 4,200 ft) above sea level, with the highest elevations occurring in the northwestern portion of the Project (Figure 1). Vegetation types vary from lowland creosote (*Larrea tridentata*) scrub and Joshua tree (*Yucca brevifolia*) woodland in the southeast to juniper (*Juniperus* spp.) shrubland on the steeper, rocky slopes in the north and west. Water within the Project is limited to a network of ephemeral drainages; there are no perennial surface waters within the Project. Highway 58 passes just north the Project, an underground portion of the Los Angeles Aqueduct runs along the southeast corner, and a network of dirt roads and off-highway vehicle trails run throughout the Project (Figure 2-1).

The Project is located within a region of high-density wind energy development, known as the Tehachapi Wind Resource Area. Alta X is part of the larger Alta Wind Energy Center, which consists of nine additional phases (Alta I-IX), which are all located to the south and west of Alta X (Figure 2-1). The Rising Tree Wind Energy Facility is located adjacent the Project to the south, with additional wind energy facilities located to the south and west of the Project.

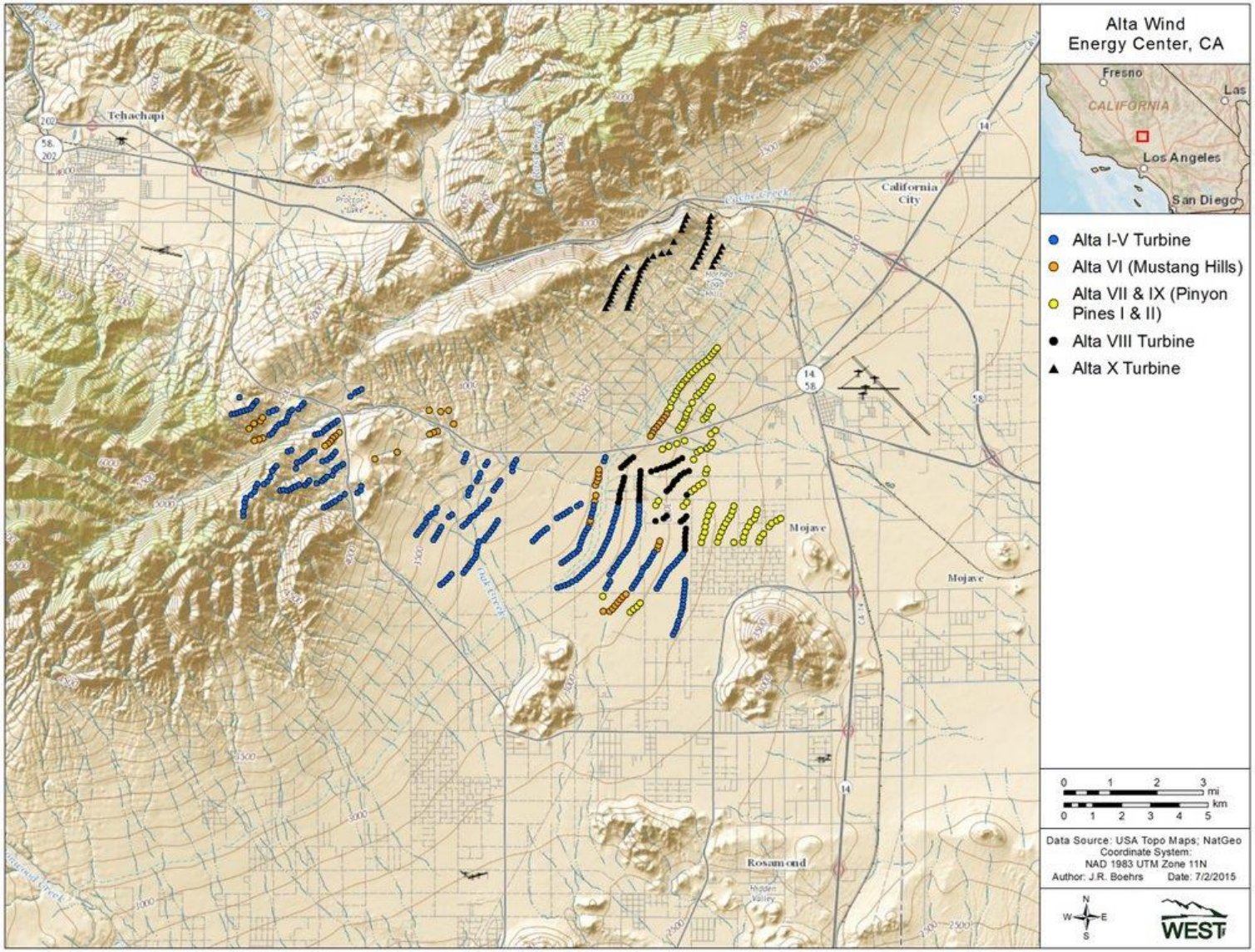

Figure 2-1. Location of the Alta X Wind Energy Project within the larger Alta Wind Energy Center.

3 METHODS

To allow for handling of fatalities and eventual reporting, Alta Wind X obtained a Federal Migratory Bird Treaty Act – Special Purpose Utility (SPUT) permit (SPUT permit #: MB19025C-3) as required by the Permit, while WEST added the Project to its California Scientific Collection Permit (SCP; SCP #: SC-003790) as required by state law.

3.1 Eagle Fatality Monitoring

The primary objective of the eagle fatality monitoring was to formally monitor the ground under Project turbines to observe, report, and document any eagle fatalities that may occur at the Project during the monitoring period. Alta Wind X developed this monitoring protocol in consultation with USFWS to ensure it was appropriate for the landscape and had a high probability of detecting eagle fatalities at the Project, should any occur. The Monitoring Plan was designed to detect large-bodied carcasses (e.g., eagles, condors) specifically, and was therefore not well designed for estimating fatality rates for smaller-bodied birds and bats in general. As such, a complete list of all non-eagle carcasses found during eagle fatality searches are included in this report, but these data were not analyzed to estimate annual fatality rates for other bird or bat species groups.

3.1.1 Standardized Carcass Searches

Search areas were developed based on square plots measuring 240-m by 240-m (787-ft by 787-ft) with the turbine at the center. Transect-based searches were conducted within search plots covering all areas within the Project out to a minimum of 120 m (394 ft) from all turbines, and up to approximately 170 m (558 ft) based on the maximum distance to the corner of a 240-m by 240-m square plot. However, because many of the turbines at the Project are located substantially closer together than 240 m, adjacent plots often overlapped, and in many cases overlapped substantially. To avoid double searching areas of overlap at adjacent turbines, search areas were developed in a Geographic Information System by dissolving areas of overlap. This resulted in five large continuous search areas associated with each of five long strings of turbines, and three individual plots where turbines were more dispersed (Figure 3-1). Coordinates associated with the final search areas were provided to field staff for uploading to a Global Positioning System (GPS) to guide field surveys.

Search areas were surveyed by walking parallel transects spaced approximately 20 m (66 ft) apart. Given the large size of eagle carcasses, it was assumed that the 20-m spacing allowed for a high probability of detection across the search areas. The observers walked at a rate of approximately 45-60 m (131-164 ft) per minute along each transect, scanning the area out to 10 m (33 ft) on either side of the transect for evidence of fatalities (e.g., carcasses or feather spots). Transects were typically walked along terrain contours and in areas where hazardous walking conditions mandated wider spacing between transects (such areas were limited), binoculars were used to ensure all areas were visually searched. All search areas were surveyed approximately every 28 days for 12 months, from early May 2017 through early May 2018 using the standardized transect method described herein.

The species, sex and age when possible, date and time encountered, GPS location, condition of carcass, and pertinent comments that indicated possible cause of death were recorded for all fatalities found during surveys. All fatalities were photographed as found, including detailed close-up photos of the carcass or feathers for identification purposes, as well as photos showing the location of the carcass or feather spot in relation to the closest WTG or other project facilities, such as overhead power lines. The condition of each carcass found was recorded using the following categories:

- Intact - a carcass that was completely intact, was not badly decomposed, and showed no sign of being fed upon by a predator or scavenger.
- Scavenged - an entire carcass, which showed signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, portion of a carcass, etc.), or a carcass that was heavily infested by insects.
- Feather Spot - 10 or more feathers or two or more primaries at one location, indicating a bird casualty had been there.

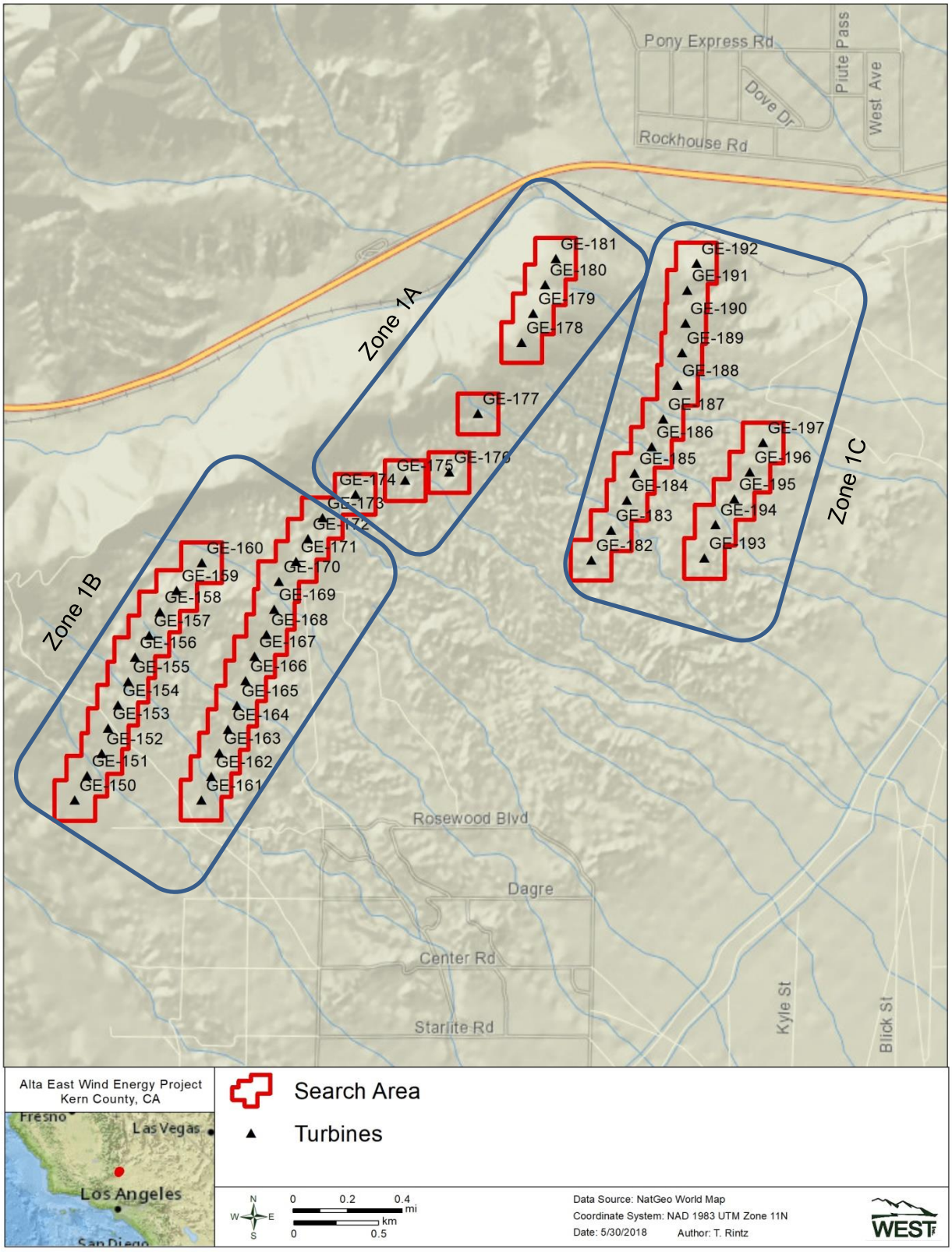

Figure 3-1. Location of eagle fatality monitoring search areas and turbine curtailment zones (blue boxes) at the Alta X Wind Energy Project, Kern County, California.

3.1.2 Searcher Efficiency and Carcass Persistence Trials

At the request of the USFWS, data on searcher efficiency and carcass persistence were collected using the integrated carcass persistence and detection methods described by Warren-Hicks et al. (2013; hereafter referred to as integrated bias trials). The integrated bias trials were implemented by WEST personnel to simultaneously test the efficiency of searchers and to provide data on carcass persistence. All bias trials were conducted using raptor carcasses obtained by Alta X from various southern California resources (e.g., airports, raptor rehabilitators). Species used for trials included red-tailed hawk (*Buteo jamaicensis*; n=5), Cooper's hawk (*Accipiter cooperi*; n=1), red-shouldered hawk (*B. lineatus*; *n=1*) osprey (*Pandion haliaetus*; n=1), great horned owl (*Bubo virginianus*; n=1), and barn owl (*Tyto alba*; n=1).

WEST personnel placed raptor trial carcasses within search plots such that they were in the field for varying amounts of time prior to the plot being searched. For example, if four raptor carcasses were available for placement, they would be distributed such that one may be at a turbine scheduled to be searched in week 1, one in week 2, one in week 3, and one in week 4. This variable schedule was intended to mimic the variable timeframes in which actual fatalities may occur within the 28 day search interval. In order to keep the trials "blind", staff conducting the formal fatality searches were not aware of the time or location of trial carcass placement. The locations of all trial carcasses were mapped and all carcasses were marked (e.g., tape on legs and/or feathers clipped) so that they could be identified as trial carcasses.

Trial carcasses were monitored by WEST personnel until all carcasses were removed, or up to a maximum of approximately 90 days (approximately three times the search interval). Carcasses were monitored on the following schedule (with day 0 considered the day of placement): days 1-7, 10, 13, 16, 19, 22, 29, 36, 43, 50, 57, 64, 71, 78, 84, 90. Some variability within this schedule occurred due to unforeseen circumstances (e.g., weather, sickness, and schedule conflicts). To estimate searcher efficiency, searchers recorded all trial carcasses found during scheduled searches. Searchers were instructed to leave trial carcasses in the field for ongoing persistence monitoring. Carcasses located by searchers were reported to WEST for inclusion in the searcher efficiency dataset. Carcasses missed in previous searches were allowed to be found in subsequent searches. To determine if carcasses were missed or if carcasses were gone and unavailable for detection, WEST personnel conducted supplemental carcass checks on days when plots were searched and trial carcasses were not reported as being found by searchers. These supplemental carcass checks contributed to both the searcher efficiency and carcass persistence datasets.

3.1.3 Statistical Analysis

- Quality Assurance and Quality Control

Quality assurance and quality control measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following each round of carcass surveys, observers were responsible for reviewing the raw data for completeness and accuracy. A Microsoft® SQL database was developed to store, organize, and retrieve survey data. Irregular codes or data suspected as questionable were discussed with the field observer

and/or Project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data, and appropriate changes in all steps were made. All data forms and electronic data files were retained for reference.

- Eagle Fatality Rate Estimation

The estimated eagle fatality rate was calculated using the fatality monitoring and bias trial data collected during the monitoring period in an Evidence of Absence (EoA) framework (Dalthorp et al. 2014). The EoA framework utilizes a statistical hierarchical model to estimate the actual number of fatalities from the number found and probability of discovery. The EoA estimator assumes the number of fatalities found during searches follows a binomial distribution

$$X \sim binomial(M, g)$$

where *X* is the count of fatalities found during standardized carcass searches, *M* is the (unknown) number of eagle fatalities, and *g* is the site-wide probability that a carcass is available to be found and detected by searchers. The site-wide probability that a carcass is available to be found and detected by searchers is based on:

- Searcher efficiency expressed as the proportion of placed carcasses found by searchers during searcher efficiency trials.
- Carcass persistence expressed as the estimated average probability a carcass was expected to remain in the study area and be available for detection by the searchers during removal trials.
- Search area adjustment based on the relative carcass density within search areas and outside of search areas

The statistical hierarchy of models inherent in EoA assumes the total number of eagle fatalities (*M*) follows a Poisson distribution,

$$M \sim Poisson(\lambda),$$

where λ is the rate that eagle fatalities occur at the site. A further step in the model hierarchy assumes λ is a Jeffreys prior, and *g* follows a beta distribution,

$$g \sim beta(\alpha, \beta).$$

3.2 Turbine Curtailment

Consistent with the avoidance and minimization measures outlined in their Permit, Alta X continued to implement their Informed Curtailment Program as described in Section 2.4.6 of their ECP. A biological monitor is staffed at the Project 365 days a year during all daylight hours. The monitor is stationed in an observation tower located in the northern portion of the Project,

between turbines GE178 and GE179 (see Figure 3-1), where they have an expansive view of the Project and surrounding area. The biological monitor records data on all eagles observed and calls in to the Project's Operations Control Center (OCC) to curtail turbines when an eagle approaches to within 1.6 km (1.0 mile) of turbines and is considered to be at risk of collision. Once notified by the observer, the OCC curtails all appropriate turbines until the biological monitor notifies the OCC that the eagle has vacated the area and no further risk exists.

For the purposes of this report, only the curtailment which occurred in response to eagle presence during the first year of the eagle fatality monitoring is considered. For the majority of this study period, all 48 turbines at the Project were shut down during each curtailment event. However, beginning in early May 2018, curtailment events became more specific, with the Project divided into three separate zones, each consisting of eight to 24 turbines (see zones 1A, 1B, 1C on Figure 3-1). Beginning in May 2018, curtailment calls were specific to the zone(s) which posed the most immediate risk to the observed eagle. Data collected for each curtailment event included the date and time the curtailment was called ordered (i.e., called in), when the curtailment actually began and ended, and the list of turbines affected.

3.3 Eagle Nesting Surveys

Consistent with their ECP, Alta Wind X personnel conducted eagle nesting surveys during the 2017 breeding season, concurrent with the initial year of monitoring. While no historical eagle nests are located within the Project, surveys of potentially suitable nesting substrates were conducted during the spring 2017 breeding season to ensure no new nests had been constructed. The majority of the Project is visible from the observation tower and biological monitors staffing the tower record all eagles observed during their daily activities; however additional pedestrian and vehicle based surveys were conducted that focused on potential nesting substrates (e.g., rocky outcrops, transmission line towers). Additionally, two 4-hour long observations were conducted in one area of potentially suitable habitat where eagles had been seen perching on a regular basis.

4 RESULTS

4.1 Eagle Fatality Monitoring

One complete round of eagle fatality searches was conducted at the Project every four weeks from May 8, 2017, through May 9, 2018, resulting in 13 surveys of each Project turbine during the first year of monitoring. Thirty bird fatalities and one bat fatality were found during standardized carcass surveys or incidentally during the study period (Table 4-1). The number, species, location, other characteristics of the bird and bat fatalities are discussed below, with a full list of fatalities presented in Appendix A.

4.1.1 Bird Fatalities

Seventeen large birds comprising six identifiable species were found at the Project during the monitoring period (Table 4-1; Appendix A). Of the 17 large bird carcasses found, 11 (65%) were gamebirds (chukar [*Alectoris chukar*], California quail [*Callipepla californica*], and mourning dove

[*Zenaida macroura*]; Table 4-1). Five raptor carcasses, consisting of two burrowing owls (*Athene cunicularia*), two red-tailed hawks, and one unidentified raptor (non-eagle) were found at the Project during the study period (Table 4-1). No eagle fatalities or evidence of eagle fatalities were found during the study period.

Thirteen small birds comprising 11 species were found at the Project during the monitoring period (Table 4-1, Appendix A). Of the 11 species identified, only two species were represented by more than one fatality (black-headed grosbeak [*Pheucticus melanocephalus*] and horned lark [*Eremophila alpestris*]; Table 4-1).

Of all the large bird fatalities documented, none were federally or state listed as threatened or endangered species. Burrowing owl is listed as a Species of Special Concern (SSC) by the California Department of Fish and Wildlife (CDFW) and a Bird of Conservation Concern (BCC) in USFWS Region 8, while yellow-headed blackbird (*Xanthocephalus xanthocephalus*) is listed as a SSC by CDFW, and common yellowthroat (*Geothlypis trichas*) is listed as a BCC in USFWS Region 8 (CDFW 2018, USFWS 2008).

Bird mortalities were documented throughout the monitoring period, with 50% of all bird fatalities documented in late spring (April - June) and 43% documented from late fall through winter (October - February; Appendix A). Two fatalities (7%) were documented during surveys conducted in August and none were documented in the months of March, July, September, or November (Appendix A).

Bird fatalities were documented throughout the Project, with the 30 bird fatalities most closely associated with 26 different turbines. Four turbines (GE188, GE194, GE163, and GE152) were recorded as being most closely associated with two avian fatalities each, while all other turbines had one (22 turbines) or zero (22) fatalities associated with them (Appendix A). All bird fatalities were found within 140 m (459 ft) of the nearest turbine, with 47% found within 80 m (262 ft) and 96% within 128 m (420 ft) of the nearest turbine (Figure 4-2 and Appendix A).

4.1.2 Bat Mortality

One bat fatality was documented at the Project during the monitoring period. The one bat fatality was a hoary bat (*Lasiurus cinereus*), and was found 67 m (220 ft) from turbine GE152 on October 24, 2017 (Table 4-1, Appendix A).

Table 4-1. Bird and bat fatalities discovered at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018.

Common Name	Scientific Name	# Fatalities
Large Birds		**17**
California quail	*Callipepla californica*	4
Chukar	*Alectoris chukar*	4
Mourning dove	*Zenaida macroura*	3
Burrowing owl	*Athene cunicularia*	2
Red-tailed hawk	*Buteo jamaicensis*	2
Common raven	*Corvus corax*	1
Unidentified raptor (non-eagle)	-	1
Small Birds		**13**
Black-headed grosbeak	*Pheucticus melanocephalus*	2
Horned lark	*Eremophila alpestris*	2
Common yellowthroat	*Geothlypis trichas*	1
Dark-eyed junco*	*Junco hyemalis*	1
Hermit thrush	*Catharus guttatus*	1
House wren	*Troglodytes aedon*	1
MacGillivray's warbler	*Geothlypis tolmiei*	1
Pacific-slope flycatcher	*Empidonax difficilis*	1
Wilson warbler	*Cardellina pusilla*	1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	1
Yellow-rumped warbler	*Setophaga coronata*	1
Bats		**1**
Hoary bat	Lasiurus cinereus	1

* found incidentally, not during scheduled search.

Table 4-2. Distribution of distances from turbines of bird and bat fatalities found within search plots at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018.

Distance to Turbine (m)	Number of Bird Mortalities	Number of Bat Mortalities
0 to 10	0	0
10 to 20	0	0
20 to 30	0	0
30 to 40	2	0
40 to 50	1	0
50 to 60	3	0
60 to 70	3	1
70 to 80	5	0
80 to 90	4	0
90-100	2	0
100-110	1	0
110-120	4	0
120-130	4	0
130-140	0	0
140-150	1	0
150-160	0	0
160-170	0	0
Total	**30**	**1**

4.1.3 Searcher Efficiency and Carcass Persistence Trials

Due to difficulties in acquiring fresh raptor carcasses for use in trials, samples sizes were limited to a total of 10 raptor carcasses placed during two integrated bias trials (Table 4-2). The first trial was initiated in December 2017 and the second was initiated in April 2018. Eight of the 10 carcasses were found on the first search following placement, resulting in 80% searcher efficiency for a single visit. All 10 carcasses were eventually found, with one of the remaining two carcasses found during the second round of searches and the other on the third round (Table 4-2).

Carcass persistence was modeled using the five carcasses placed during the first round of integrated bias trials only, as the persistence monitoring of the second round of bias trial carcasses was still underway as of the writing of this report. Of the five trial carcasses placed for the first trial, two disappeared between checks conducted on days 21 and 29, one disappeared between checks on days 84 and 91, and two persisted for the duration of the trial and were still available on day 91 when the trial concluded (Table 4-2). Survival regression modeling, assuming an exponential distribution of the data, resulted in an estimated mean carcass persistence time of approximately 107 days (95% CI 37 - 452 days). Based on the 28-day search interval and modeled carcass persistence time, there was an estimated 87% (95% CI: 0.69% – 0.97%) probability that a large raptor carcass would persist through the search interval and be available for detection. While not included in the analysis for this report, all five carcasses being monitored for persistence during the second trial were still present at day 60, and will continue to be monitored through approximately day 90.

Table 4-2. Searcher efficiency and carcass persistence results based on raptor carcasses placed during integrated bias trials at the Alta X Wind Energy Project during the first year of eagle fatality monitoring, May 2017 – May 2018.

Species	Date Placed	Date Found	# Searches to Find	Days Since Placement	Estimated Carcass Persistence (Days)
Barn owl	12/11/17	12/18/17	1	7	25
Red-tailed hawk	12/11/17	12/15/17	1	4	25
Red-tailed hawk	12/11/17	2/7/18	3	58	87
Red-tailed hawk	12/11/17	12/19/17	1	8	91*
Red-tailed hawk	12/11/17	12/27/17	1	16	91*
Red-shouldered hawk	4/2/18	5/2/18	1	30	n/a
Cooper's hawk	4/2/18	4/18/18	1	16	n/a
Great horned owl	4/2/18	4/24/18	1	22	n/a
Osprey	4/2/18	5/8/18	2	36	n/a
Red-tailed hawk	4/2/18	4/20/18	1	18	n/a

n/a = not available as trials were still being monitored for carcass persistence

* indicates that the carcass was still available for detection at end of trial period

4.1.4 Eagle Mortality Estimate

As noted previously, no eagle fatalities were documented during the first year of formal eagle fatality monitoring conducted from May 2017 – May 2018 at the Project. Based on the bias trial data, we assumed a searcher efficiency rate of 80% and a k = 1.0 (k is the factor by which searcher efficiency changes with each successive search). This indicates that there was no reduction in searcher efficiency if a carcass was missed and found on a subsequent search. Based on the searcher efficiency and carcass persistence data, the resulting site-wide probability a carcass was available to be found and detected by searchers (*g*) was 0.752 (95% CI = 0.49 - 0.94) for the year of monitoring (Table 1). Consistent with the finding of no eagle fatalities during the first year of monitoring, EoA resulted in at least an 80% probability that zero fatalities actually occurred. The parameters of the beta distribution in the EoA analysis were *ba*=9.2154 and *bb*=3.0313.

4.2 Turbine Curtailments in Response to Eagle Presence

During the May 2017 - May 2018 monitoring period, 90 curtailment calls were made to the OCC in response to golden eagle presence in the vicinity of turbines (Appendix B). Turbine curtailments lasted from zero minutes (turbines did not shut down before the curtailment was cancelled) to a maximum of 68 minutes. Seventy of the 90 (78%) curtailments lasted for 15 minutes or less and only three curtailment events exceeded one hour (Appendix B). Combined, the 90 curtailment calls resulted in 18 hours and 47 minutes of curtailment time, with from eight to 48 turbines curtailed during each event. When extrapolated to the total number of turbines curtailed, this equated to 886 turbine-hours of curtailment related to golden eagles during the monitoring period, with one turbine-hour equating to one turbine being shut down for one hour.

4.3 Eagle Nesting Surveys

On February 8, 2017, the biological monitor posted in the observation tower observed a pair of golden eagles copulating at a nearby rock outcrop to the southwest of turbine GE179, approximately 0.25 miles outside of the Project area. On February 14, 2017, a 4-hour long observation survey was conducted at this location (from 9:00 am – 1:00 pm) to assess the area for potential golden eagle nesting activity. A second observational survey of the area was conducted on May 15, 2017, also lasting for four hours (7:00 am – 11:00 am). The area consists of low quality nesting habitat and no nests were observed. The rock out-cropping is occasionally used by golden eagles as a perch site, but does not appear to be an adequate substrate to support an eagle nest. No nests or eagle nesting activity were observed during either 4-hour survey. Additional driving surveys of potential nesting substrates within the Project were conducted on February 14 and May 18, during which Alta Wind X staff drove access roads within the Project and searched substrates that could potentially support large nests (e.g., transmission lines, meteorological towers, and other Project infrastructure). No raptor or other large stick nests were identified during either of the surveys within the Project; however, one common raven (*Corvus corax*) nest was located offsite on a nearby transmission line tower.

5 DISCUSSION

5.1 Potential Biases

There are numerous factors that could contribute to both positive and negative biases in estimating mortality rates (Erickson 2006). The overall design of this study incorporates several assumptions or factors that could impact the results of mortality estimation. One such bias is that fatalities could occur outside of the search areas, and therefore be missed by searchers. To account for this bias, search plot boundaries were developed based on the ballistic model of Hull and Muir (2010), which was developed to predict the fall zone of carcasses of different size classes (e.g., small birds, large birds, bats) for turbines of different sizes. Based on the Hull and Muir (2010) model, the 240-m square search plots associated with each turbine capture approximately 99% of the fall zone for large birds based on the turbine size at Alta X. This area correction is factored into the EoA analysis to account for potential bias associated with fatalities that could have fallen outside of the delineated search areas. The Hull and Muir area is based on individual plots measuring 240 m on a side and does not take into consideration the large amount of overlap among most plots, which results in a much larger search area that extends more than 120 m in some directions from the majority of turbines. As such the use of the Hull and Muir estimate is considered a conservative estimate of survey coverage.

Other potential biases are associated with the experimental carcasses used in searcher efficiency and carcass removal trials and whether or not they are representative of actual carcasses. This may occur if the types of birds used are larger or smaller than the carcasses of actual fatalities, or more or less cryptic in color than the actual fatalities. Eagle carcasses are not available for use in bias trials and commercially available gamebirds (e.g., mallard [*Anas platyrhynchos*] and ring-necked pheasant [*Phasianus colchicus*]) are not considered to be good surrogates for estimating raptor carcass persistence. Therefore, we used a variety of raptors

obtained offsite (i.e., regional airports and/or raptor rehabilitators) to estimate both searcher efficiency and carcass persistence. It is believed that raptor carcasses in general provide a better representation of scavenging rates for eagles than would other non-raptor surrogates. The raptor carcasses used in bias trials were in some cases substantially smaller than golden eagles, which could make them less conspicuous; however, differences in coloration could in some cases make them more conspicuous. Overall, however, it is believed that the carcasses used provide a reasonable estimate of searcher efficiency at the Project.

Concern has also been raised regarding how the number of carcasses placed in the field for carcass removal trials on a given day could lead to biased estimates of scavenging rates (e.g., Smallwood 2007, Smallwood et al. 2010). Hypothetically, this would lead to underestimating true scavenging rates if the scavenger densities are low enough such that scavenging rates for these placed carcasses are lower than for actual mortalities. The logic is that if the trials are based on too many carcasses on a given day, scavengers are unable to access all trial carcasses, whereas they could access all carcasses from wind turbine collisions. If this is the case, and the trial carcass density is much greater than actual turbine fatality density, the trials would underestimate scavenging rates compared to rates for actual fatalities. The contrary is also possible where placing carcasses may draw in more scavengers and carcasses could be removed more quickly than normal. For this study, the number of raptor carcasses available for use in trials was very limited and only five carcasses were placed for each trial. With only five carcasses placed throughout the Project in each trial, most of which persisted for more than a month, there seemed to be little reason to suspect trial carcasses had a significant influence on scavenging rates. Additional trials during the second year of monitoring will add to the overall bias trial dataset and provide a larger sample size for the 2-year analysis to be conducted following the second year of monitoring.

5.2 Bird Fatalities

While fatality rates were not calculated for birds in general, due to the study design being focused on eagles, some insights can be gained in examining the non-eagle raptor fatalities found during the study. Based on the bias trial data, searcher efficiency was high and raptor carcasses persisted for relatively long time periods, which resulted in all bias trial carcasses being found by searchers. While the number of trial carcasses placed during the study was relatively low (*n=10*), the fact that all 10 were found suggests that few (if any) raptor fatalities that may have occurred at the Project during the study period were missed by searchers. As such, the five raptor fatalities documented during surveys is likely a good estimation of the number of raptor fatalities that actually occurred during the monitoring period. This is consistent with results of the three years of bird and bat fatality monitoring at the Project that occurred from 2014-2017 and resulted in raptor fatality rates from zero to 0.03 raptors/MW/year, which equates to six or fewer raptors per year at the Project (Thompson and Chatfield 2018).

While golden eagles are known to occur as fatalities at wind farms, eagle fatalities are generally considered rare events and are more often discovered as incidental fatalities at facilities compared to the number found during formal avian fatality monitoring studies (Pagel et al. 2013). Fatality estimation for such rare events presents challenges (Huso et al. 2014),

especially when study designs result in an overall site-wide probably of detection (*g*) substantially less than 1.0. This is often the case for standard bird and bat fatality studies designed to estimate bird and bat fatality rates in general as those studies often search a subset of turbines and deal with carcasses that can be difficult to detect and/or may persist on the landscape for very short amounts of time, all of which lead to decreased *g* values. For these reasons, the study described herein was designed to result in a high *g*-value that results in a robust estimate of potential eagle fatalities at the Project which can be used to assess Alta Wind X's compliance with the terms of its Permit.

The EoA analysis for the first year of monitoring resulted in a high probability (at least 80%) that there were in fact no eagle fatalities during the monitoring period. Given these results, eagle mortality at the Project appears to be within the terms of the Permit. Given the results of the first year of monitoring, additional analyses were conducted within the EoA framework to simulate future study results pending possible study design modifications. Based on the bias trial data collected during the first year of monitoring, simulations indicated that increasing the search interval from four weeks up to 12 weeks would have no substantial influence on results at the 80% probability level, assuming no eagle fatalities were found during the second year of study (i.e., zero found would = an 80% probability that zero occurred). However, simulations indicated that if one fatality were found, the 80% probability would increase to two or fewer fatalities for an 8-week interval and three or fewer fatalities for a 12-week interval. Based on these simulations it was decided in coordination with the USFWS (H. Beeler; personal communication) that search intervals during the second year of study could be extended to 60 days. With the exception of the lengthened search interval, all other components of the eagle fatality monitoring study are recommended to stay the same during the second year of monitoring.

5.3 Bat Mortality

During the three years of formal bird and bat fatality monitoring at the Project, bat mortality has been consistently low, ranging from 0.42 to 0.80 bats/MW/year (Thompson and Chatfield 2018). Consistent with those previous results, only one bat fatality was documented during the initial year of eagle fatality searches. While the current study was not designed to document bat fatalities, and bat fatality rates were not calculated, the paucity of fatalities suggests that bat mortality continued to be relatively low during the study period.

5.4 Turbine Curtailment

Turbine curtailment was a key minimization measure defined in the ECP and Permit for Alta X. Turbine curtailments in response to eagle presence were ordered throughout the year, with no consistent pattern observed by season (Figure 5-1). While it is unknown if any eagle fatalities were prevented by curtailing turbines, curtailment likely reduced the level of exposure to rotating turbine blades for those eagles that did utilize areas within the Project. The curtailment program will continue at Alta X going forward, with refinements to the program recently put in place that allow for curtailment calls to be ordered by zone, thereby reducing the number of turbines that may be curtailed at a given time. The use of turbine zones will allow Alta Wind X to maximize energy production by limiting curtailments to only a subset of turbines in closest proximity to eagles that may approach or enter the Project area.

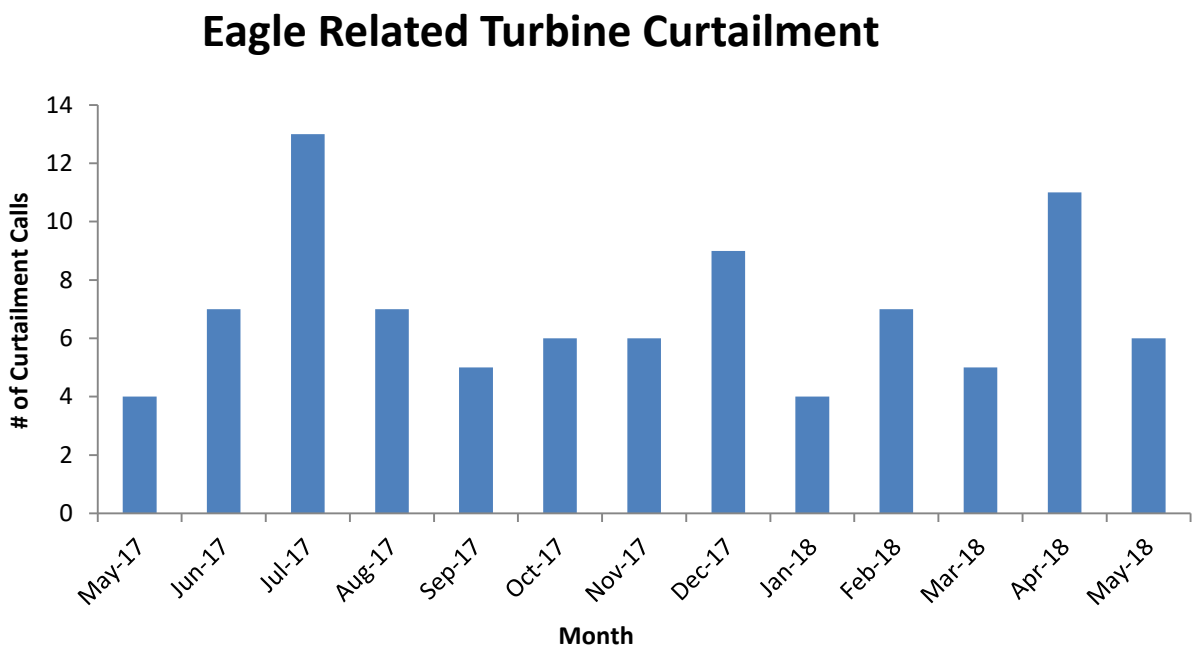

Figure 5-1. Temporal pattern of turbine curtailment in response to eagle presence at the Alta East Wind Energy Project, Kern County, California, from May 2017 – May 2018.

CONCLUSIONS

Results of the first year of formal eagle fatality monitoring at the Project indicate that the Alta X project has successfully completed its first year of operation in compliance with the Project's Permit. With no eagle fatalities found during the yearlong monitoring period and integrated bias trials that resulted in all trial carcasses being found, EoA analysis supports a fatality estimate of zero eagle fatalities for the monitoring period, which is consistent with the observed data. A second year of eagle-specific fatality monitoring has already begun at the Project, with a study design that is consistent with the first year of monitoring, except that the search interval has been extended to approximately 60 days. Alta Wind X will continue to implement the mitigation measures identified in their ECP and Permit during the second year of eagle fatality monitoring. An analysis of the cumulative 2-year dataset will be completed upon conclusion of the second year of monitoring to ensure that Alta Wind X continues to operate in compliance with the terms of its Permit.

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Appendix A. List of Fatalities Found During Eagle Fatality Monitoring Studies at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018

Appendix A. Complete listing of fatalities for the Alta X Wind Energy Project for studies conducted from May 8, 2017 – May 9, 2018.

Date	Common Name	Search Plot	Distance from Turbine (m)	Type of Find	Condition
2017-05-08	Black-headed grosbeak	GE 152-153	61	full plot	feather spot
2017-05-08	House wren	GE 152-153	79	full plot	feather spot
2017-06-14	Unidentified raptor (non-eagle)	GE 165-166-167	58	full plot	feather spot
2017-06-29	Mourning dove	GE 188-189	119	full plot	feather spot
2017-08-02	Yellow-rumped warbler	GE 157-158-159	80	full plot	scavenged
2017-08-21	California quail	GE 193	38	full plot	feather spot
2017-10-17	Chukar	GE 194	80	full plot	feather spot
2017-10-19	Mourning dove	GE 188-189	118	full plot	feather spot
2017-10-24	Hoary bat	GE 152-153	67	full plot	intact
2017-10-25	California quail	GE 160	53	full plot	feather spot
2017-10-27	Red-tailed hawk	GE 161-162	101	full plot	feather spot
2017-12-01	California quail	GE 171-172-173	70	full plot	feather spot
2017-12-04	California quail	GE 176	68	full plot	feather spot
2017-12-08	Horned lark	GE 180-181	128	full plot	feather spot
2017-12-08	Chukar	GE 180-181	140	full plot	feather spot
2017-12-18	Burrowing owl	GE 150-151	123	full plot	feather spot
2018-01-05	Chukar	GE 178-179	115	full plot	feather spot
2018-01-16	Common raven	GE 161-162	40	full plot	feather spot
2018-02-06	Burrowing owl	GE 194	71	full plot	feather spot
2018-02-08	Red-tailed hawk	GE 185-186-187	80	full plot	feather spot
2018-04-24	Mourning dove	GE 170	87	full plot	intact
2018-04-24	Wilson warbler	GE 171-172-173	126	full plot	intact
2018-04-25	Dark-eyed junco	GE 165-166-167	124	inc	feather spot
2018-05-01	Hermit thrush	GE 182-183	75	full plot	feather spot
2018-05-02	Yellow-headed blackbird	GE 177	62	full plot	feather spot
2018-05-03	Chukar	GE 180-181	54	full plot	feather spot
2018-05-07	Horned lark	GE 194	77	full plot	intact
2018-05-08	Pacific-slope flycatcher	GE 190-191-192	37	full plot	intact
2018-05-09	Black-headed grosbeak	GE 188-189	98	full plot	intact

Appendix A. Complete listing of fatalities for the Alta X Wind Energy Project for studies conducted from May 8, 2017 – May 9, 2018.

Date	Common Name	Search Plot	Distance from Turbine (m)	Type of Find	Condition
2018-05-09	MacGillivray's warbler	GE 188-189	98	full plot	intact
2018-05-09	Common yellowthroat	GE 195-196-197	119	full plot	scavenged

Appendix B. Turbine Curtailment Events Related to Golden Eagle Observations Recorded During the First Year of Eagle Fatality Monitoring at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018.

Appendix B. Turbine curtailments ordered at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018 in response to the presence of golden eagles.

Date	Time Curtailment Ordered	Time Curtailment Began	Curtailment Lag Time (minutes)	Time Curtailment Ends	Total Curtailment Time (hh:min)	Turbines Curtailed	Number of Turbines Curtailed	Cumulative Turbine Curtailment Time (hh:mm)
5/12/2017	14:44	14:47	0:03	14:53	0:06	GE 150-197	48	04:48
5/12/2017	5:44	5:47	0:03	6:01	0:14	GE 150-197	48	11:12
5/14/2017	6:01	6:04	0:03	6:09	0:05	GE 150-197	48	04:00
5/24/2017	16:54	16:57	0:03	17:16	0:19	GE 150-197	48	15:12
6/4/2017	9:01	9:04	0:03	9:12	0:08	GE 150-197	48	06:24
6/4/2017	8:10	8:12	0:02	8:23	0:11	GE 150-197	48	08:48
6/4/2017	9:22	9:25	0:03	9:41	0:16	GE 150-197	48	12:48
6/7/2017	19:28	19:30	0:02	19:42	0:12	GE 150-197	48	09:36
6/23/2017	12:57	13:00	0:03	13:12	0:12	GE 150-197	48	09:36
6/24/2017	7:56	7:59	0:03	8:08	0:09	GE 150-197	48	07:12
6/30/2017	6:38	6:41	0:03	6:52	0:11	GE 150-197	48	08:48
7/1/2017	19:46	19:50	0:04	19:53	0:03	GE 150-197	48	02:24
7/4/2017	8:38	8:41	0:03	8:47	0:06	GE 150-197	48	04:48
7/5/2017	14:28	14:30	0:02	14:46	0:16	GE 150-197	48	12:48
7/11/2017	10:49	10:50	0:01	10:55	0:05	GE 150-197	48	04:00
7/11/2017	11:35	11:36	0:01	11:41	0:05	GE 150-197	48	04:00
7/11/2017	6:07	6:09	0:02	6:18	0:09	GE 150-197	48	07:12
7/14/2017	16:35	16:38	0:03	16:53	0:15	GE 150-197	48	12:00
7/15/2017	9:08	9:11	0:03	9:18	0:07	GE 150-197	48	05:36
7/16/2017	16:36	16:38	0:02	16:45	0:07	GE 150-197	48	05:36
7/16/2017	12:02	12:05	0:03	12:23	0:18	GE 150-197	48	14:24
7/16/2017	6:32	6:34	0:02	6:54	0:20	GE 150-197	48	16:00
7/17/2017	7:32	7:35	0:03	7:41	0:06	GE 150-197	48	04:48
7/23/2017	18:31	18:33	0:02	18:45	0:12	GE 150-197	48	09:36
8/5/2017	7:30	7:34	0:04	7:43	0:09	GE 150-197	48	07:12
8/5/2017	9:54	9:58	0:04	10:08	0:10	GE 150-197	48	08:00

Appendix B. Turbine curtailments ordered at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018 in response to the presence of golden eagles.

Date	Time Curtailment Ordered	Time Curtailment Began	Curtailment Lag Time (minutes)	Time Curtailment Ends	Total Curtailment Time (hh:min)	Turbines Curtailed	Number of Turbines Curtailed	Cumulative Turbine Curtailment Time (hh:mm)
8/5/2017	7:56	7:59	0:03	8:32	0:33	GE 150-197	48	02:24
8/12/2017	18:56	18:59	0:03	19:15	0:16	GE 150-197	48	12:48
8/16/2017	18:42	18:45	0:03	19:17	0:32	GE 150-197	48	01:36
8/17/2017	11:49	11:52	0:03	12:00	0:08	GE 150-197	48	06:24
8/29/2017	17:39	17:40	0:01	17:51	0:11	GE 150-197	48	08:48
9/17/2017	6:37	6:39	0:02	6:43	0:04	GE 150-197	48	03:12
9/18/2017	8:32	8:35	0:03	8:38	0:03	GE 150-197	48	02:24
9/19/2017	7:34	7:37	0:03	7:39	0:02	GE 150-197	48	01:36
9/21/2017	10:45	10:47	0:02	11:21	0:34	GE 150-197	48	03:12
9/29/2017	7:11	7:14	0:03	7:39	0:25	GE 150-197	48	20:00
10/12/2017	8:24	8:26	0:02	8:34	0:08	GE 150-197	48	06:24
10/15/2017	17:03	17:06	0:03	17:09	0:03	GE 150-197	48	02:24
10/16/2017	14:15	14:17	0:02	14:23	0:06	GE 150-197	48	04:48
10/19/2017	13:33	13:37	0:04	14:14	0:37	GE 150-197	48	05:36
10/30/2017	8:47	8:52	0:05	8:55	0:03	GE 150-197	48	02:24
10/30/2017	8:21	8:23	0:02	8:30	0:07	GE 150-197	48	05:36
11/2/2017	10:26	-	-	11:34	1:08	GE 150-197	48	06:24
11/3/2017	8:29	8:32	0:03	9:10	0:38	GE 150-197	48	06:24
11/5/2017	8:51	8:52	0:01	8:58	0:06	GE 150-197	48	04:48
11/9/2017	10:06	10:08	0:02	10:58	0:50	GE 150-197	48	16:00
11/9/2017	14:36	14:38	0:02	15:38	1:00	GE 150-197	48	00:00
11/15/2017	9:45	9:48	0:03	9:54	0:06	GE 150-197	48	04:48
12/4/2017	15:44	15:46	0:02	15:49	0:03	GE 150-197	48	02:24
12/5/2017	12:04	12:07	0:03	12:14	0:07	GE 150-197	48	05:36
12/6/2017	11:17	11:19	0:02	11:23	0:04	GE 150-197	48	03:12
12/6/2017	10:55	10:58	0:03	11:05	0:07	GE 150-197	48	05:36

Appendix B. Turbine curtailments ordered at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018 in response to the presence of golden eagles.

Date	Time Curtailment Ordered	Time Curtailment Began	Curtailment Lag Time (minutes)	Time Curtailment Ends	Total Curtailment Time (hh:min)	Turbines Curtailed	Number of Turbines Curtailed	Cumulative Turbine Curtailment Time (hh:mm)
12/6/2017	14:33	14:35	0:02	14:43	0:08	GE 150-197	48	06:24
12/10/2017	11:34	11:35	0:01	12:36	1:01	GE 150-197	48	00:48
12/11/2017	11:13	11:14	0:01	11:36	0:22	GE 150-197	48	17:36
12/16/2017	7:57	7:59	0:02	8:07	0:08	GE 150-197	48	06:24
12/17/2017	10:32	10:34	0:02	10:46	0:12	GE 150-197	48	09:36
1/13/2018	14:25	14:27	0:02	14:39	0:12	GE 150-197	48	09:36
1/14/2018	10:18	10:20	0:02	10:30	0:10	GE 150-197	48	08:00
1/16/2018	16:02	16:03	0:01	16:14	0:11	GE 150-197	48	08:48
1/26/2018	7:24	7:28	0:04	7:36	0:08	GE 150-197	48	06:24
2/11/2018	7:26	7:30	0:04	7:32	0:02	GE 150-197	48	01:36
2/11/2018	6:36	6:40	0:04	6:44	0:04	GE 150-197	48	03:12
2/12/2018	13:12	13:15	0:03	13:17	0:02	GE 150-197	48	01:36
2/19/2018	6:32	6:34	0:02	6:37	0:03	GE 150-197	48	02:24
2/19/2018	15:43	15:45	0:02	15:50	0:05	GE 150-197	48	04:00
2/19/2018	13:55	13:59	0:04	14:04	0:05	GE 150-197	48	04:00
2/27/2018	17:18	17:22	0:04	17:25	0:03	GE 150-197	48	02:24
3/1/2018	14:26	14:28	0:02	14:39	0:11	GE 150-197	48	08:48
3/1/2018	6:20	6:23	0:03	7:17	0:54	GE 150-197	48	19:12
3/4/2018	12:24	12:28	0:04	12:29	0:01	GE 150-197	48	00:48
3/4/2018	14:29	14:30	0:01	14:35	0:05	GE 150-197	48	04:00
3/10/2018	15:39	-	-	15:51	0:00	GE 150-197	48	00:00
4/5/2018	7:26	7:28	0:02	7:44	0:16	GE 150-197	48	12:48
4/9/2018	9:39	9:40	0:01	9:45	0:05	GE 150-197	48	04:00
4/9/2018	8:25	8:27	0:02	8:37	0:10	GE 150-197	48	08:00
4/11/2018	6:49	6:57	0:08	7:01	0:04	GE 150-197	48	03:12
4/11/2018	6:50	6:52	0:02	7:01	0:09	GE 150-197	48	07:12

Appendix B. Turbine curtailments ordered at the Alta X Wind Energy Project from May 8, 2017 – May 9, 2018 in response to the presence of golden eagles.

Date	Time Curtailment Ordered	Time Curtailment Began	Curtailment Lag Time (minutes)	Time Curtailment Ends	Total Curtailment Time (hh:min)	Turbines Curtailed	Number of Turbines Curtailed	Cumulative Turbine Curtailment Time (hh:mm)
4/20/2018	7:48	7:50	0:02	8:00	0:10	GE 150-197	48	08:00
4/20/2018	6:12	6:19	0:07	6:43	0:24	GE 150-197	48	19:12
4/22/2018	15:32	15:37	0:05	15:41	0:04	GE 150-197	48	03:12
4/22/2018	15:32	15:34	0:02	15:41	0:07	GE 150-197	48	05:36
4/23/2018	9:34	9:37	0:03	9:44	0:07	GE 150-197	48	05:36
4/23/2018	9:36	9:37	0:01	9:44	0:07	GE 150-197	48	05:36
5/1/2018	6:42	6:48	00:06	6:50	00:02	GE 174-181	8	00:16
5/1/2018	10:31	10:33	00:02	10:37	00:04	GE 174-181	8	00:32
5/6/2018	18:51	18:53	00:02	18:58	00:05	GE 174-181	8	00:40
5/7/2018	13:04	13:07	00:03	13:10	00:03	GE 174-181	8	00:24
5/7/2018	7:00	7:02	00:02	7:06	00:04	GE 150-173	24	01:36
5/7/2018	6:56	6:59	00:03	7:06	00:07	GE 174-181	8	00:56